

What is the next best step in patients with spinal cord injury who report poor sleep?

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There are an estimated 300,000 people in the United States living with spinal cord injury.¹ Due to medical advances, many of these patients are living longer and are therefore suffering from chronic medical conditions related to age and their underlying injury. Sleep may be poor in patients suffering with spinal cord injury due to a variety of reasons. Spinal cord dysfunction may lead to respiratory compromise, which increases the risk for central sleep apnea, obstructive sleep apnea, and sleep-related hypoventilation.² Untreated obstructive sleep apnea is associated with myocardial infarction, stroke, cardiac arrhythmias, and diabetes. Insomnia is more common in this group due to pain, nocturia, muscle spasms, restless legs syndrome, and circadian rhythm disorders.³ Insomnia and sleep-disordered breathing may lead to poor quality of life, as well as higher mortality in patients with spinal cord injury, just as it does in the general population or patients with other comorbidities.⁴

The article in this issue by Chiodo *et al.* summarizes available literature (up to 2013) in regards to sleep-related breathing disorders in patients with spinal cord injury.⁵ In addition to examining prevalence of sleep-disordered breathing in this population and adherence rates of treatments, the authors explore several distinct questions, including how certain factors affect sleep-disordered breathing in patients with spinal cord injury as compared to the general population. They highlight the impact of important clinical issues such as the effects of medications, body position, or autonomic dysfunction on sleep. They also raise the question: Is sleep-disordered breathing responsible for higher mortality seen in patients in spinal cord injury? Unfortunately, as the authors point out, there is a scarcity of studies and medical evidence to adequately answer all of the important questions raised.

As concluded by the authors, there is a high prevalence of sleep-related breathing disorders (central sleep apnea, obstructive sleep apnea and sleep-related hypoventilation) in this population, though the reported range is wide. The authors make the reader aware that the method of diagnosis and definitions used on sleep studies can affect the reported prevalence and severity of obstructive sleep apnea and other sleep-related breathing disorders. This is also true in prevalence studies of obstructive sleep apnea in the general population as well, with rates varying greatly based upon type of test used to diagnose sleep apnea (in-lab polysomnography versus home sleep apnea testing) as well as the definition used to identify scoreable respiratory events on sleep studies.⁶ Table 2 in their article includes a column specifying the definition used for sleep disordered breathing to further illustrate this point. Regardless of definition or diagnostic test used, prevalence rates of sleep disordered breathing are universally higher than the general population, making the case that spinal cord injury patient should be screened for this condition. The authors aptly point out that it may be difficult to use traditional screening methods for obstructive sleep apnea in this population as currently used questionnaires and surveys have not been validated in this specific population.

How should clinical providers of patients with spinal cord injuries proceed? The authors note it may be difficult to determine which type of test is superior in the evaluation of sleep-related breathing disorders. However, the American Academy of Sleep Medicine (AASM) Clinical Guidelines continue to recommend in-lab, attended polysomnography, performed with end-tidal carbon dioxide [CO₂] monitoring, as the gold standard for diagnosis for these patients, given the higher risk of central sleep apnea and hypoventilation, both of which are weaknesses and exclusion criteria for unattended, home sleep apnea tests.⁷ In-lab, attended polysomnography provides a comprehensive

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assessment of the respiratory system during sleep, even in patients with spinal cord injury, as they do in other comorbid conditions causing neuromuscular weakness. Though there is less published literature on patients with spinal cord injury, it is common for most large accredited sleep centers to evaluate abundant patients with comorbid respiratory or neuromuscular conditions for sleep apnea. Furthermore, the International Classification of Sleep Disorders, 3rd edition provides specific definitions of sleep-related hypoventilation using polysomnography parameters, specifically end-tidal CO₂.

Treatments for obstructive sleep apnea include positive airway pressure (PAP) therapy. Adherence to PAP therapy is suboptimal in the general population, and may be even worse in the spinal cord injury population.² In cases of poor adherence to PAP therapy, there are other treatments available for obstructive sleep apnea that should be considered, including positional therapy or mandibular advancement devices.⁸

In summary, I congratulate the authors for increasing awareness of sleep problems in patients with spinal cord injury. This review article strongly asserts that patients with spinal cord injury should be screened for sleep-related breathing disorders given the high prevalence. At the present time, it seems prudent to pursue traditional in-lab, attended polysomnography when available to best characterize the different sleep-related breathing disorders that can be present in this group, as well as to adequately treat these conditions with attended in-lab PAP titrations given the limitations of auto-titrating PAP machines in the home setting. Home sleep apnea testing with end-tidal CO₂ monitoring can be explored as this may in the future lead to better access and convenience for patients.⁹ It is equally important that sleep centers provide testing environments conducive to this patient population and

others who require specialized care due to their comorbid medical conditions. The AASM already requires that all accredited sleep centers have handicap accessible sleep testing rooms and restrooms, but more accommodations should be considered. More research is needed to evaluate changes in outcomes, quality of life, and possibly mortality if sleep is made refreshing and rewarding for patients with spinal cord injury. It is also important that other common sleep disorders beyond sleep-related breathing disorders, such as insomnia, sleep deprivation, and circadian rhythm disorders are also properly identified and treated in this patient population.

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